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A STUDY OF THE BACTERIOLOGICAL AND SANITARY CONDITION OF THE MILK SUPPLY OF NEW YORK CITY.*

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(From the Research Laboratory, Department of Health, New York City.)

The following study of the bacteriological and sanitary condition of the milk supply of New York City was undertaken at the request of Dr. W. H. Park, general director of the Division of Laboratories, and was carried on and completed under his direct supervision.

The milk samples which form the basis of this study were taken by the members of the bacteriological squad and comprised samples of both city and country milk. Owing to the distances from New York City at which the creameries were located and the difficulties of transportation these men had to be provided with the simplest kind of an outfit for taking these samples. This outfit consists of the following articles: an aluminium pipette 21 inches long and $\frac{1}{4}$ inch in diameter; a screw-necked vial 3 inches long and $\frac{7}{8}$ of an inch in diameter, with an aluminium cap bearing a serial number; a round tin box 5 inches in diameter and $3\frac{1}{4}$ inches high to contain the sample bottles; two sizes of copper pipette holders

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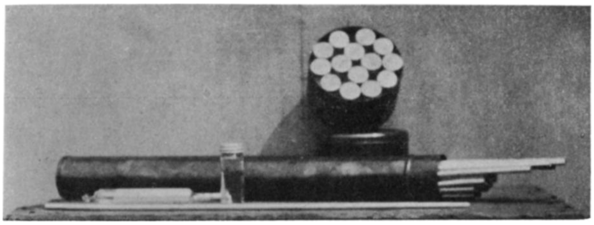
* Received for publication April 5, 1912.

of the round type (see photograph), (*a*) holder 22 inches long, 2 inches in diameter, to hold 40 pipettes; (*b*) holder 22 inches long, 1 inch in diameter, to hold 10 pipettes. The pipettes, bottles, and cans are thoroughly sterilized on two consecutive days and then shipped once a week to the country inspectors.

The members of the bacteriological squad who take city samples carry pipettes, holders, and bottles of the same type, but in addition are provided with leather bags 18 inches long, log-cabin type, lined with aluminium and fitted with trays for holding the milk samples, and ice to keep them cold while being gathered.



Outfit carried by inspectors.

Method of taking samples in the country.—The samples are taken by means of the aluminium pipettes before described, placed in the one-ounce vials, packed in the round tins, placed in an old milk can, and thoroughly surrounded with ice. A hole is made in the bottom of the can so as to provide for drainage. The can is then wired, labeled, and shipped on the milk freight train together with the milk from which the samples were taken. Upon their arrival at the city terminal the samples are at once collected by an inspector who ices them again thoroughly and brings them to the laboratory, where he checks up the samples and writes his report. He also frequently takes control samples from the regular milk shipments. The method of taking the samples in the city is practically the same except that the inspectors use the bags described and bring the samples directly to the laboratory.

Methods employed at the laboratory.—(*a*) All glassware used in milk work is sterilized for an hour at 160° F on two consecutive days. The dilution bottles are of the square type and are graduated at 50 c.c. and 100 c.c., respectively. The water used for dilutions is ordinary tap water filtered through a Berkefeld filter and sterilized by boiling on two consecutive days in a specially constructed heater from which it is filled directly into the bottles and used without resterilizing. The pipettes used are of two kinds, the ordinary volumetric pipette graduated to 1/100 of a c.c. and a short pipette 5 inches long and $\frac{1}{4}$ inch in diameter with three markings, $\frac{1}{2}$ c.c.–1 c.c. (see Fig. 1). We are also using what we term the ring method.

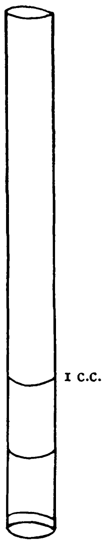
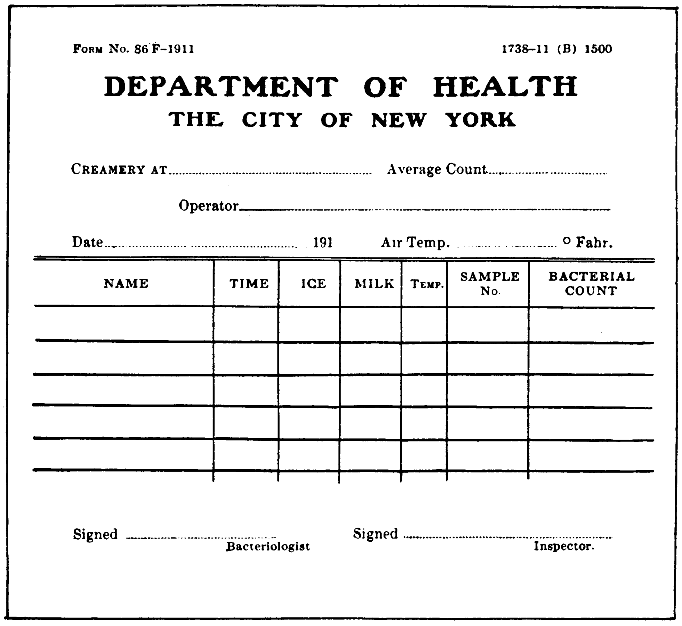


FIG. 1.—Special pipette in use.

Ring method.—It was found after a number of experiments that a small $\frac{1}{8}$-inch No. 20 japanned curtain ring would take up within 5 per cent of 0.01 c.c. of milk and that by dropping this ring full of milk directly into the melted agar tube, we could eliminate one or more of the dilution bottles and thus save labor and a possible source of error. The rings are dipped into the milk by means of a platinum hook and dropped directly into about 8 c.c. of nutrient agar held in the tube.

Method of plating and counting.—Each inoculated tube is shaken 10 times and plated. The Petri dishes after marking are packed into paper-lined crates holding 60 or more plates and incubated at a temperature of 37° C. for 48 hours. They are then examined and counted and the count placed directly upon the plates. From these plates the counts are entered upon the bacteriological cards sent to us by the inspectors.

Method of recording data obtained from cards.—The items of information concerning the samples taken in the country are the location of the creamery, its owner, the name of the dairyman, the time the sample was taken, the temperature and the quality of the milk, the manner of cooling, number of samples, and the bacteriological result (see Fig. 2). The city card varies somewhat, as shown in the illustration (Fig. 3). In the laboratory the results from the creameries are recorded on the ledger sheet shown in Fig. 4; the sheet gives the name of the owner, name and location of creameries controlled by him, the kinds of milk shipped, bacteriological counts, the temperature of samples, the manner of cooling the milk, the result of the dirt test, and other facts bearing upon the bacteriological results. These sheets are kept in ledger form and a monthly statement is drawn. The bacteriological results from the samples taken in the city are tabulated in a similar manner.



FORM No. 86 F-1911 1738-11 (B) 1500

DEPARTMENT OF HEALTH

THE CITY OF NEW YORK

CREAMERY AT .... Average Count ....

Operator ____________________________

Date .... 191 Air Temp. .... ° Fahr.

NAME	TIME	ICE	MILK	TEMP.	SAMPLE No.	BACTERIAL COUNT

Signed .... Bacteriologist

Signed .... Inspector.

(Size of card, 5×8.)

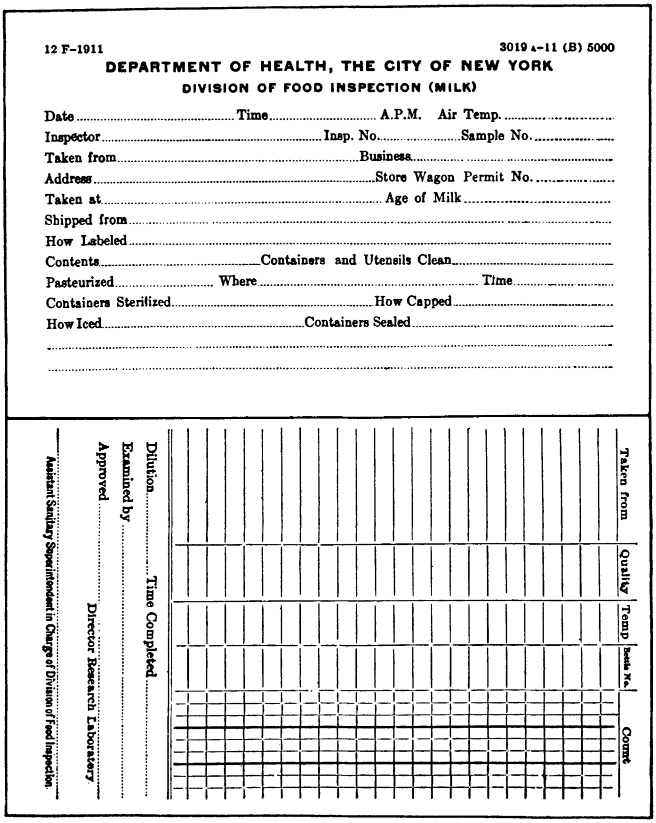
FIG. 2.

Analysis of samples.—The total number of bacteriological analyses made was 61,142. The various sources are best shown in Table 1.

TABLE 1.

Source	No. of Samples
Country creameries	22,761
Pasteurizing plants	5,049
Stores	19,876
Wagons	6,132
Hospitals	5,406
Infant health stations	504
Special examinations	1,414
	61,142

For the purpose of this study there were taken 20,334 samples of country milk and 1,950 samples of milk as delivered in the city. These samples of country milk represent the milk from 432 creameries situated as previously stated. The creameries are controlled by 120 of the large dealers who supply New York City with milk.



12 F-1911 3019 a-11 (B) 5000

DEPARTMENT OF HEALTH, THE CITY OF NEW YORK

DIVISION OF FOOD INSPECTION (MILK)

Date .... Time .... A.P.M. Air Temp. ....
Inspector .... Insp. No. .... Sample No. ....
Taken from .... Business ....
Address .... Store Wagon Permit No. ....
Taken at .... Age of Milk ....
Shipped from ....
How Labeled ....
Contents .... Containers and Utensils Clean ....
Pasteurized .... Where .... Time ....
Containers Sterilized .... How Capped ....
How Iced .... Containers Sealed ....

Taken from	Quality	Temp	Bottle No.	Count

Dilution .... Time Completed ....
Examined by ....
Approved ....
Director Research Laboratory.

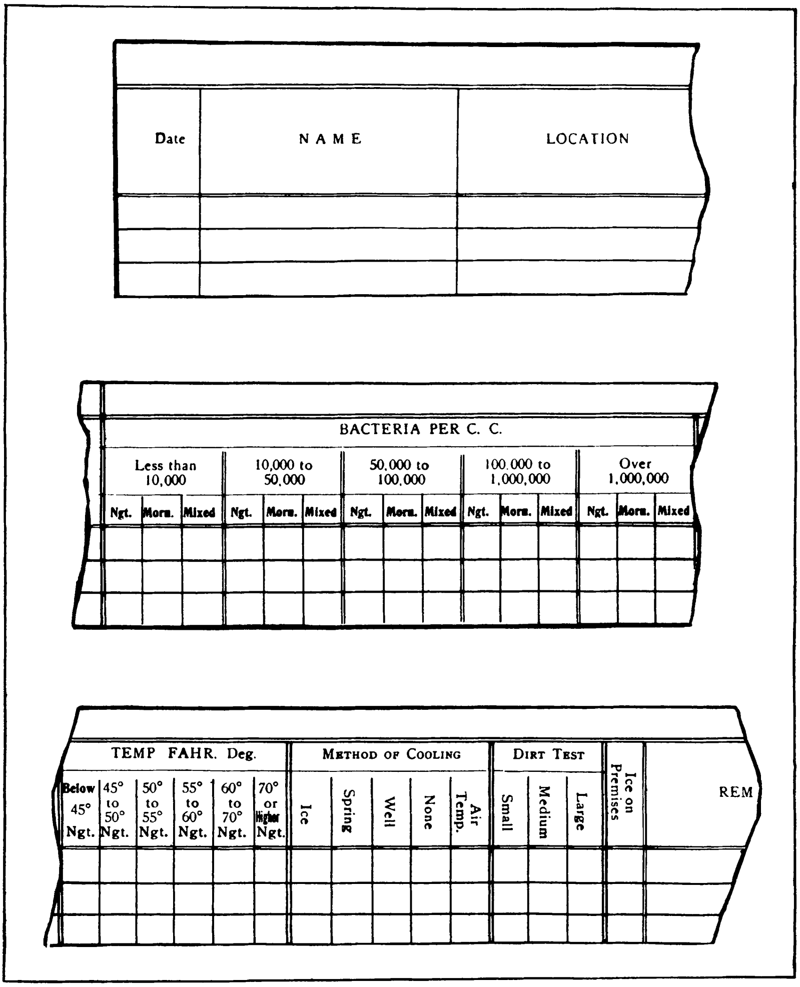
....
Assistant Sanitary Superintendent in Charge of Division of Food Inspection.

(Size of card, 3×5.)

FIG. 3.

Analysis of country milk.—A study of the bacteriological findings as recorded in Table 2 shows that of the 20,334 samples taken for bacteriological examinations 7,756, or 38.14 per cent, contained less than 10,000 bacteria per c.c.; 6,633, or 32.61 per cent, contained from 10,000 to 50,000 bacteria per c.c.; 2,403, or

11.81 per cent, contained from 50,000 to 100,000 bacteria per c.c.; 2,723, or 13.39 per cent, contained from 100,000 to 1,000,000 bacteria per c.c.; 819, or 4.02 per cent, contained 1,000,000 or over bacteria per c.c.



Date	NAME	LOCATION

BACTERIA PER C. C.														
Less than 10,000			10,000 to 50,000			50,000 to 100,000			100,000 to 1,000,000			Over 1,000,000		
Ngt.	Morn.	Mixed	Ngt.	Morn.	Mixed	Ngt.	Morn.	Mixed	Ngt.	Morn.	Mixed	Ngt.	Morn.	Mixed

TEMP FAHR. Deg.						METHOD OF COOLING					DIRT TEST			Ice on Premises	REM
Below 45° Ngt.	45° to 50° Ngt.	50° to 55° Ngt.	55° to 60° Ngt.	60° to 70° Ngt.	70° or Higher Ngt.	Ice	Spring	Well	None	Air Temp.	Small	Medium	Large		

FIG. 4.—Headings on ledger sheet.

Adding together the number of samples which contained less than 50,000 bacteria per c.c. it will be found that 14,389, or 70.75 per cent of all samples analyzed, fall into this class.

Contrasting the highest with the lowest percentage of samples of each group it will be found that in the division of less than 10,000 per c.c. April ranks highest, having 673 samples, or 59 per cent, out of a total of 1,140 samples; August lowest, with 332 samples, or 23.8 per cent, out of a total of 1,393.

TABLE 2.
ANALYSIS OF BACTERIOLOGICAL COUNTS.

	TOTAL OF SAMPLES	BACTERIA PER C.C.									
		Less than 10,000		10,000 to 50,000		50,000 to 100,000		100,000 to 1,000,000		1,000,000 or over	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
January	1,274	579	45.44	472	37.	128	10.	91	7.14	4	.3
February	1,466	578	39.42	613	41.68	169	11.49	100	6.8	6	.4
March	1,241	682	54.90	421	33.89	90	7.24	39	3.13	9	.7
April	1,140	673	59.	289	25.14	78	6.78	94	8.17	6	.52
May	2,097	874	41.95	580	27.84	303	14.54	293	14.06	47	2.25
June	2,099	621	29.58	689	32.82	206	9.81	410	19.53	173	8.24
July	830	299	35.88	239	28.68	132	15.84	130	15.60	30	3.60
August	1,393	332	23.81	340	24.38	181	13.18	319	22.67	221	15.85
September	2,152	550	25.55	533	24.76	298	13.84	525	24.39	246	11.43
October	2,802	1,135	39.72	934	32.59	315	11.02	358	12.53	60	2.1
November	2,514	988	39.29	1,032	41.05	308	12.25	180	7.15	6	.23
December	1,326	445	33.55	491	37.02	195	14.71	184	13.87	11	.82
	20,334	7,756	38.14	6,633	32.61	2,403	11.81	2,723	13.39	819	4.02

In the 10,000–50,000 group February ranks highest, having 613 samples, or 41.68 per cent, out of a total of 1,466 samples; August lowest, with 340 samples, or 24.38 per cent, out of a total of 1,393.

In the 50,000–100,000 group July ranks highest, having 132 samples, or 15.84 per cent, out of a total of 830 samples; April lowest, with 78 samples, or 6.78 per cent, out of a total of 1,140.

In the 100,000–1,000,000 group September ranks highest, having 525 samples, or 24.39 per cent, out of a total of 2,152 samples; March lowest, with 39 samples, or 3.13 per cent, out of a total of 1,241.

In the group containing 1,000,000 or over per c.c., August ranks highest, having 221 samples, or 15.85 per cent, out of a total of 1,393 samples; November lowest, with 6 samples, or 0.23 per cent, out of a total of 2,514.

Temperature of milk at time of delivery.—The temperatures of the milk from which those samples were taken are shown in Table 3. Owing to the extreme haste with which these samples had to be taken at times, and other adverse circumstances, it was not always possible to procure the temperatures of the milk at the time it was sampled. We were fortunate enough, however, to obtain the temperature of 18,698 specimens of milk, and the percentages shown in Table 3 are based upon these figures. This table also shows the number and percentage of samples in the divisions adopted, namely, below 45° F., 45–50°, 50–55°, 55–60°, 60–70°, and 70° F. and over. They are as follows:

Below 45° F. there were 3,767 samples, or 20.1 per cent out of a total of 18,698.

45 to 50° F. there were 3,568 samples, or 19 per cent out of a total of 18,698.

50 to 55° F. there were 3,945 samples, or 21 per cent out of a total of 18,698.

55 to 60° F. there were 3,603 samples, or 19.2 per cent out of a total of 18,698.

60 to 70° F. there were 3,141 samples, or 16.7 per cent out of a total of 18,698.

70° F. or over there were 674 samples, or 3.6 per cent out of a total of 18,698.

Contrasting the highest with the lowest percentage of samples having a temperature of less than 50° F. it will be found that in the division of temperatures less than 50° F. February ranks highest, with 771 samples, or 72 per cent, out of a total 1,063 samples; August lowest, with 55 samples, or 4.6 per cent, out of a total 1,171.

In the division of temperatures from 50 to 60° F., June ranks highest, with 1,069 samples, or 54.8 per cent out of a total 1,969 samples; November lowest, with 570 samples, or 23 per cent out of a total of 2,438 samples.

In the division of temperatures from 60 to 70° F., August ranks highest, with 604 samples, or 51 per cent out of a total 1,171 samples; March lowest, with 34 samples, or 2.7 per cent out of a total of 1,241 samples.

TABLE 3.

TEMPERATURE OF MILK AS RECEIVED AT CREAMERIES.

MONTHS 1911	TEMPERATURE FAHRENHEIT														
	Total Samples	Temperatures Stated in	Temperatures Not Stated in	Less than 45°		45° to 50°		50° to 55°		55° to 60°		60° to 70°		70° and over	
				No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
January	1,274	987	287	408	41.33	269	27.23	179	18.1	80	8.1	42	4.25	9	0.9
February	1,466	1,063	403	521	49.01	250	23.51	123	11.57	82	7.7	47	4.42	40	3.75
March	1,241	1,224	17	397	32.46	449	36.6	251	20.5	86	7.	34	2.7	7	.57
April	1,140	1,024	116	315	30.71	337	32.8	225	21.9	91	8.8	37	3.6	19	1.8
May	2,097	2,034	63	105	5.16	265	13.02	441	21.68	625	30.72	549	26.49	49	2.40
June	2,099	1,969	130	27	1.37	121	6.1	533	27.06	536	27.22	615	31.23	137	6.95
July	830	721	109	15	1.98	31	4.2	137	19.	216	29.9	168	23.3	154	21.3
August	1,393	1,171	222	14	1.19	41	3.5	121	10.3	271	23.1	604	51.5	120	10.2
September	2,152	2,056	96	95	4.62	154	7.49	391	19.01	697	33.90	640	31.12	79	3.84
October	2,802	2,690	112	307	11.41	625	23.23	803	29.85	644	23.94	273	10.14	38	1.41
November	2,514	2,438	76	1,047	42.92	745	30.5	396	16.2	174	7.1	70	2.8	6	.24
December	1,326	1,321	5	516	39.	281	21.2	345	26.	101	7.6	62	4.6	16	1.2
	20,334	18,698	1,636	3,767	20.13	3,568	19.08	3,945	21.09	3,603	19.26	3,141	16.74	674	3.6

In the last division, 70° F. or over, July ranks highest with 154 samples, or 21 per cent out of a total of 721 samples.

Method of cooling.—The data which were gathered by the inspectors concerning the method of cooling employed by the dairymen to cool their milk are given in Table 4. It will be noticed that the same discrepancy which has already been spoken of exists between the total number of samples taken and the number in which data were obtainable. The total number of samples in which the cooling method was stated was 16,475, or 81.02 per cent; the number in which the method of cooling was not stated was 3,859, or 18.97 per cent.

TABLE 4.

METHOD OF COOLING.

MONTH OF YEAR	NUMBER OF SAMPLES	SAMPLES FOR WHICH COOLING METHOD WAS NOT STATED		SAMPLES FOR WHICH COOLING METHOD WAS STATED		SAMPLES FOR WHICH COOLING METHOD WAS ICE		SAMPLES FOR WHICH COOLING METHOD WAS NOT ICE	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
January	1,274	454	35.63	820	64.35	422	51.46	398	48.53
February	1,466	851	58.04	615	41.95	371	60.32	244	39.67
March	1,241	290	23.36	951	76.63	449	47.21	502	52.78
April	1,140	69	6.05	1,071	93.94	659	61.53	412	38.47
May	2,097	237	11.47	1,860	88.53	1,345	72.31	515	27.69
June	2,099	635	30.22	1,464	69.74	812	55.46	652	44.53
July	830	130	15.66	700	84.33	354	50.57	346	49.42
August	1,393	224	16.08	1,169	83.91	583	49.87	586	50.12
September	2,152	358	16.62	1,794	83.31	525	28.71	1,269	71.23
October	2,802	242	8.63	2,560	91.34	621	24.25	1,939	75.74
November	2,514	263	10.46	2,251	89.36	499	21.95	1,752	77.83
December	1,326	106	8.25	1,220	91.50	268	21.94	952	78.03
	20,334	3,859	18.97	16,475	81.02	6,908	41.93	9,567	58.06

Of those in which the method of cooling was stated, ice was used in 6,908 instances, or 41.93 per cent, and was not used in 9,567 instances, or 58.06 per cent. We also found that the number and percentage of samples where ice was used varied in the different quarters of the year. This factor is also influenced by the character and location of the creameries, the dairymen drawing to the better-class creameries using ice more frequently than those who drew to the poorer class. Grouping the results obtained into the four quarters of the year gives us the following summary:

	Total Number of Samples Delivered at Creameries	Total Number in Which Cooling Was Stated	Number Using Ice	Percentage
1st quarter	3,981	2,386	1,242	52
2d “	5,336	4,395	2,816	64
3d “	4,375	3,663	1,462	39
4th “	6,642	6,031	1,388	22
	20,334	16,475	6,908	41

It will be seen from these summaries how comparatively few dairymen use ice in cooling their milk. It is of interest to note that in July, 50 per cent of the milk brought in was cooled by ice, 61 per cent at a temperature of 50° F. or under, and 64 per cent of the milk contained less than 50,000 bacteria per c.c. The greater part of the samples taken in July were of those known as morning's milk. This milk is usually brought to the creameries without cooling, therefore the records of the temperatures of the milk in July were high and the bacteriological counts low.

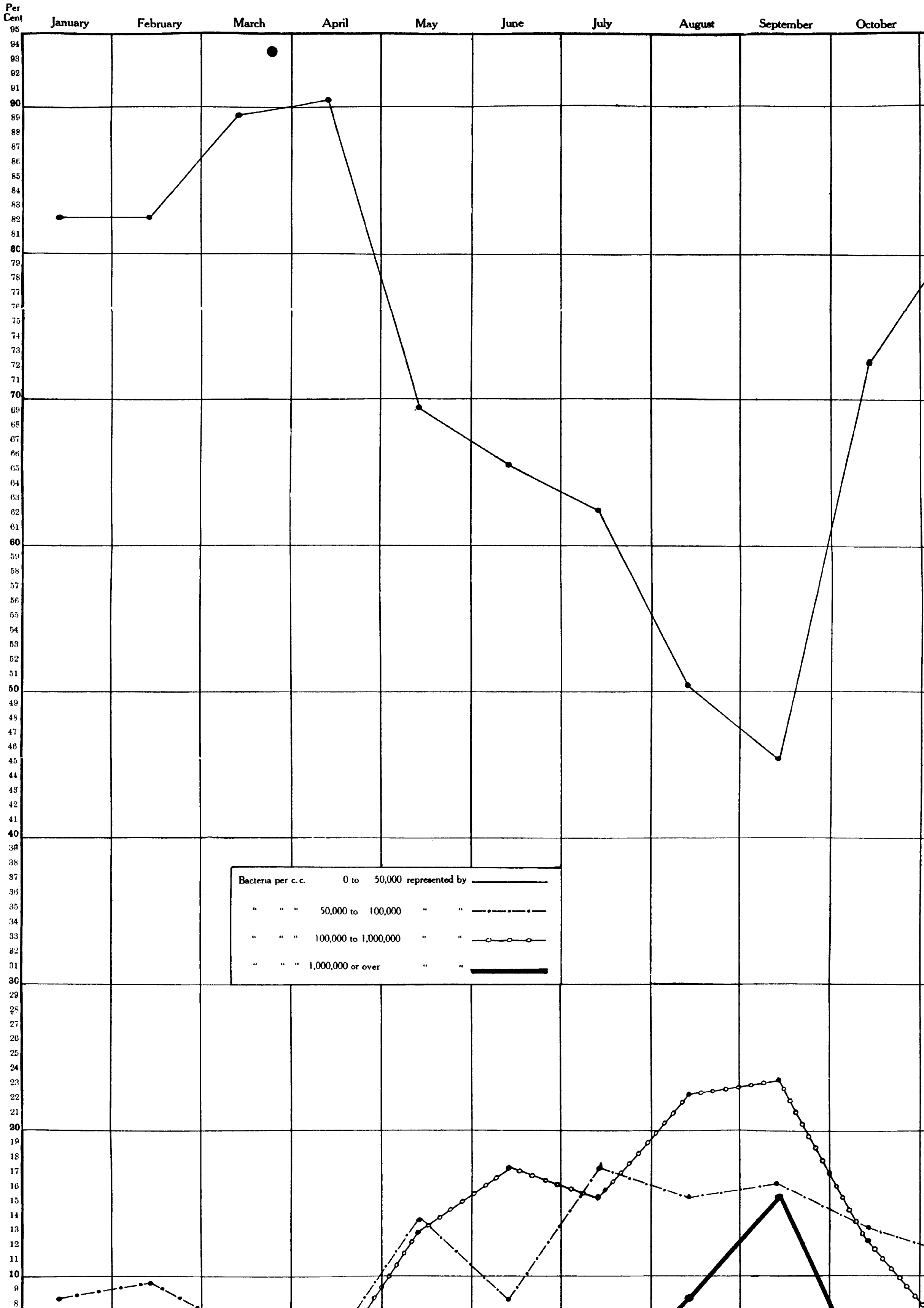
The preceding analysis was based upon the total number of samples taken and their relation to each other as a whole. In the following analysis (Table 5) the milk is divided into the three grades in which it is delivered to the creameries by the dairymen; namely, night's, morning's, and mixed milk. It therefore shows in addition the number of samples of each grade taken, together with the number and percentage of samples falling into each one of the five groups of bacteriological counts. It also shows the temperatures of the samples taken from these three grades of milk as they were delivered at the creameries, and the number and percentage of the samples in each of the six divisions we have adopted as a standard of temperatures. It also gives a detailed statement of the methods of cooling employed by the dairymen. Taking up the different groups of bacteriological counts we find that the morning's milk had the highest percentage of low counts, 82.19 per cent having less than 50,000 bacteria per c.c., and the night's milk had the lowest percentage of samples in that group, namely, 64.8 per cent. A brief summary of these percentages is given on p. 12.

Night's milk.—Considering the preceding summary it will be noticed that while 64 per cent of the samples are under 50,000, 34 per cent contained 50,000 or over per c.c., notwithstanding the fact that the largest number of samples were taken during the cold months, when the atmospheric temperature would naturally have some effect in reducing the bacterial content and holding bacterial growth in check. This comparatively large percentage of bacteria may be ascribed to either one or both of two factors: increased contamination of the milk due to the fact that the cows are housed and not kept as clean as in the summer time, and use of utensils which were not clean.

BACTERIAL COUNTS PER c.c.

TYPE OF MILK	TOTAL NUMBER OF SAMPLES	LESS THAN 50,000		50,000 TO 100,000		100,000 TO 1,000,000		1,000,000 TO 100,000,000	
		Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage
Night's	9,885	6,477	64.8	1,244	12.45	1,622	16.2	542	6.4
Morning's...	1,202	988	82.19	111	9.23	89	7.4	14	1.6
Mixed	9,247	6,924	74.	1,048	11.5	1,012	11.11	263	2.8
		14,389	70.76	2,403	11.81	2,723	13.39	819	4.02

While comparatively few samples of morning's milk were sent to the laboratory for analysis, it is of interest to note that 46.8 per cent had less than 10,000 bacteria per c.c. and 82 per cent of the samples contained less than 50,000 bacteria per c.c. This low bacterial content held its own during the months of April, May, June, and July, when the percentages were respectively 81, 75, 79, 87 per cent of the total number of samples taken of morning's milk for those months. These results bear out the statement made above concerning time as a factor as well as the extra contamination of milk during the winter months, and the effect of the unclean utensils. Most of the morning's milk was delivered within two hours after milking. The night's milk and the mixed milk, being made up of night's and morning's milk, is, on account of its being held, more readily affected than either of the two other grades by the three factors stated; namely, by increased contamination due to the unclean condition of the cattle, unclean utensils, and lack of icing. Owing to the fact that it approximates closely the grade of milk delivered to city consumers for the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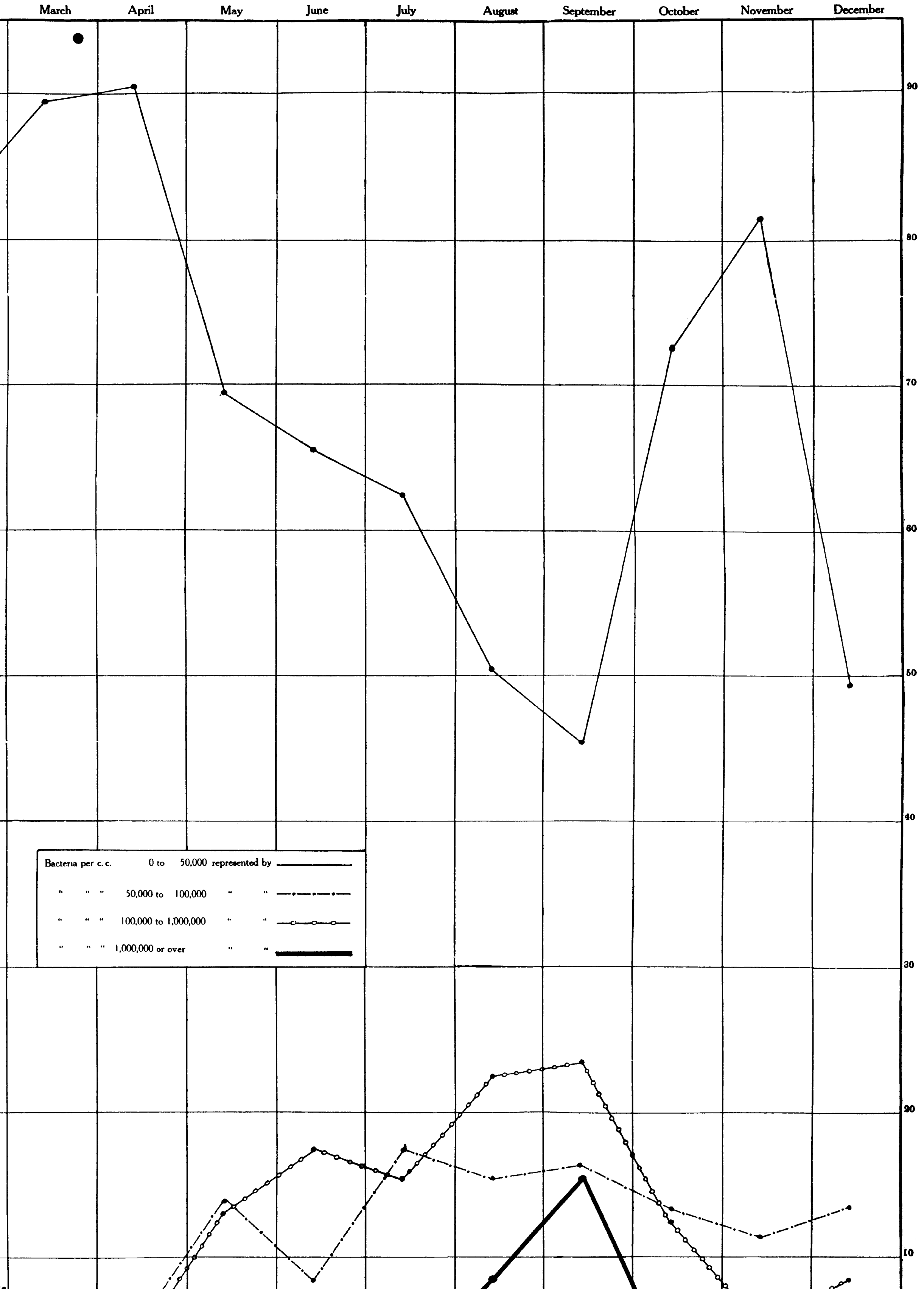
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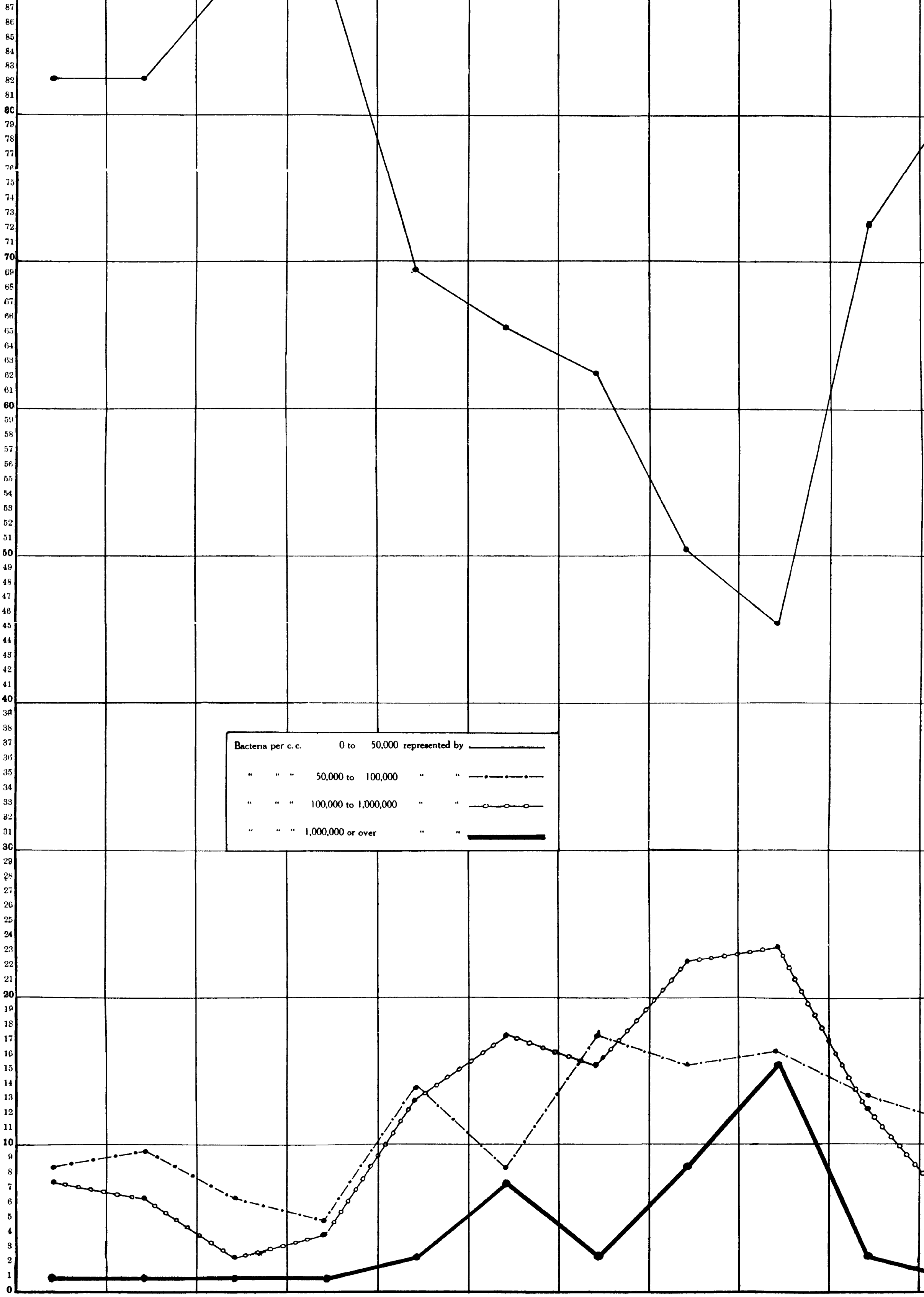
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1
0
Bacteria per c.c. 0 to 50,000 represented by
" " " 50,000 to 100,000 " "
" " " 100,000 to 1,000,000 " "
" " " 1,000,000 or over " "

CHART 1.

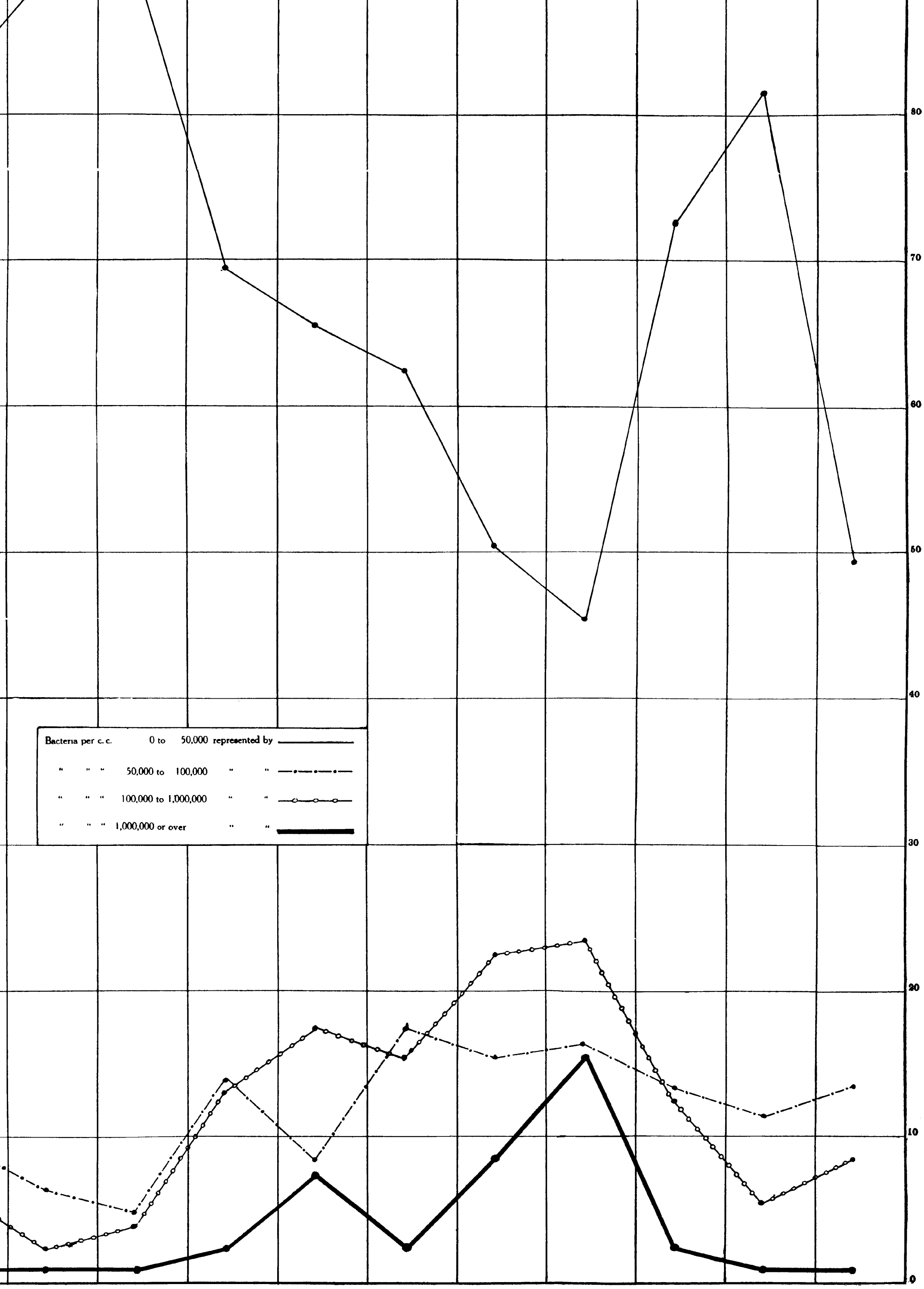

Bacteria per c.c. 0 to 50,000 represented by
" " " 50,000 to 100,000 " "
" " " 100,000 to 1,000,000 " "
" " " 1,000,000 or over " "
80
70
60
50
40
30
20
10
0

CHART 1.

entire year, a detailed study of the bacterial count of the mixed milk was made. The bacteriological curve obtained is shown in Chart 1.

A comparison of the chart with the table gives us the percentages shown. These are briefly summarized as follows:

Months	Total Number of Samples of Mixed Milk		Less than 50,000 Bacteria per c.c.		50,000 to 100,000 Bacteria per c.c.		100,000 to 1,000,000 Bacteria per c.c.		1,000,000 or over Bacteria per c.c.	
	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage
January	912	100	757	82.96	81	8.87	72	7.89	2	.10
February	961	"	796	82.83	93	9.67	66	6.86	6	.62
March	900	"	810	90.00	60	6.6	27	2.9	3	3.3
April	467	"	423	90.57	22	4.7	21	4.49	1	.21
May	1,257	"	877	69.68	175	13.82	172	13.58	33	2.6
June	931	"	613	65.73	84	8.98	166	17.76	68	7.27
July	429	"	268	62.47	83	17.33	68	15.64	10	2.33
August	385	"	202	52.46	60	15.	88	22.	35	8.75
September	518	"	234	45.17	84	4.37	120	23.39	80	15.59
October	761	"	544	71.48	101	13.23	95	12.44	21	2.75
November	1,223	"	1,010	82.5	138	11.17	74	5.99	1	.08
December	503	"	390	77.53	67	13.32	43	8.54	3	.59

It will be observed that the percentage of milk containing less than 50,000 bacteria per c.c. drops steadily from its highest level of 91 per cent in April until it reaches the lowest point, or 45 per cent, in September, and that the percentage of milk containing a million or more bacteria per c.c. follows the inverse curve and reaches its highest point in July. Table 5 also shows clearly that most of the samples were brought in at a temperature ranging from 50 to 60° F., and a considerable portion between 60 and 70° F.

Having thus briefly considered the bacteriological content of the milk as received at the creameries together with a few of the factors influencing the same, it was thought best to consider also the milk as it was offered for sale in New York City, in order to ascertain: (1) what was the general bacteriological content of the milk sold; (2) the age of milk as offered for sale; (3) the relative bacteriological content of the raw milk sold in cans or bottles; of the pasteurized milk sold in cans or bottles, together with samples taken of the milk pasteurized by the flash process and known as heated milk; (4) some of the sanitary conditions surrounding its care and sale. For this purpose 1,950 samples were selected from the large number of samples examined. Four months of the year, January, April, July, and October, were selected as representative types of the different seasons, and 100 samples of each month's supply of milk of the grades mentioned were chosen, except in the case of heated milk where it was impossible to procure this number from different dealers. These numbers represent the milk supplied by 160 of the principal dealers, being carefully selected to represent as many sources and dealers as possible. The data procured are set forth in Table 6. Considering these data in detail, we find that the raw milk sold in cans and bottles taken as a whole gives the following results:

MONTHS	TOTAL NUMBER OF SAMPLES	LESS THAN 50,000 BACTERIA PER C.C.		50,000 TO 100,000 BACTERIA PER C.C.		100,000 TO 1,000,000 BACTERIA PER C.C.		1,000,000 OR OVER BACTERIA PER C.C.	
		Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage
January	200	57	28.5	22	11.	78	40.53	43	20.5
April...	200	47	23.5	33	16.5	88	44.	36	18.
July...	200	25	12.5	11	5.5	94	47.	70	35.
October	200	28	14.	20	10.	80	40.	72	36.

Contrasting the above results with the bacteriological counts of the milk as delivered to the creameries in the country during these months, the following differences present themselves:

MONTHS	TOTAL NUMBER OF SAMPLES	LESS THAN 50,000 BACTERIA PER C.C.		50,000 TO 100,000 BACTERIA PER C.C.		100,000 TO 1,000,000 BACTERIA PER C.C.		1,000,000 BACTERIA PER C.C.	
		Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage
January									
Country.....	1,274	1,051	82.4	128	10.	91	7.13	4	.3
City........	200	57	28.5	22	10.5	78	39.	43	21.5
April									
Country.....	1,140	962	84.3	78	6.7	94	8.1	6	0.52
City........	200	47	23.5	33	16.5	84	42.0	36	18.
July									
Country.....	830	538	64.	132	15.84	130	15.60	30	3.6
City........	200	25	12.5	11	5.5	94	47.	70	35.
October									
Country.....	2,802	2,069	73.84	315	11.02	358	12.5	60	2.1
City........	200	28	14.	20	10.	80	40.	72	36.

The increase in the bacterial content of city milk over that of country milk is marked, and not wholly accounted for by the factor of time in allowing increase of bacteria. This may be partly accounted for by the fact that milk was frequently shipped in cans and bottles which were not clean and were poorly iced in transit.

Age of milk.—The following figures concerning the age of milk as sold in New York City are based upon the date placed upon the labels attached to the cans. These dates do not, however, give the true age of the milk, as in numerous instances the milk is 12 or more hours old before it reaches the creamery, and then it may be held over at the creamery from 12 to 24 hours longer, before it is placed upon the milk train for transmission to the city.

Months	Total Number of Samples	Number Age Not Stated	Number Age Stated	24–36 Hours Percentage	36–48 Hours Percentage	48 Hours and over Percentage
January.........	200	62	138	72	19.	7.2
April............	200	6	194	72	13.6	13.9
July............	200	30	170	93	....	15.
October	200	12	188	88	25.	16.

Based upon the above figures it can be safely stated that 78 per cent of the raw milk reaches New York and is sold from 24 to 36 hours after leaving the creamery, 10 per cent, 36 to 48 hours, 9 per cent, 48 hours and over, some of it being more than 72 hours old. The actual age would be about an additional 12 to 24 hours.

Temperature of raw milk as offered for sale in New York City.—The temperature of the milk while offered for sale as shown by the following data is interesting:

TEMPERATURES.

MONTHS	TOTAL NUMBER OF SAMPLES	UNDER 45° F.		45–50° F.		50–55° F.		55–60° F.		60–70° F.	
		Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage	Number of Samples	Percentage
January.	200	171	85.5	14	7.	15	7.5	..	..	..	..
April ...	200	157	78.5	28	14.	15	7.5	..	..	..	..
July....	200	82	41.	65	32.5	38	19.	11	5.5	4	2.
October.	200	109	54.5	70	35.	21	10.5	..	..	..	..
		519	64.8	177	22.1	89	11.1	11	1.37	4	0.5

Taking the total number of samples of raw milk selected for study, it will be seen that 64.8 per cent of the milk examined was held in New York at a temperature of less than 45° F.; 22 per cent was found to be from 45 to 50° F.; 11 per cent was from 50 to 55° F.; 1.37 per cent from 55 to 60° F.; and 0.5 per cent 70° F. and over.

Comparison of bacterial counts of raw milk as sold in cans and bottles.—The figures upon which this comparison is based are given in Table 6. Taking the average bacterial count of the samples for each month, we find that with the exception of the samples examined in October there is not the great difference in the counts we had hoped to find in favor of bottled milk. A comparison of these counts is given below:

Months	Containers	Average Bacterial Counts
January	Cans	318,500
	Bottles	317,450
April	Cans	295,450
	Bottles	169,050
July	Cans	510,000
	Bottles	289,000
October	Cans	380,160
	Bottles	43,230

Comparison showing the variation of the quantities of milk held at a temperature below 45° F.:

	January	April	July	October
	Percentage	Percentage	Percentage	Percentage
Cans	90	89	71	89
Bottles	95	96	76	90

It will be seen from the foregoing that the advantage of lower bacterial count and lower temperatures is slightly in favor of the milk sold in bottles.

Pasteurized milk sold in cans.—Pasteurized milk sold in cans is delivered as a rule to the hospitals, and therefore the output is fairly limited. It, however, represents the type of milk used by the hospitals during the past year.

PASTEURIZED MILK IN CANS.

Percentage of Age of Milk.

Months	Not Stated	Stated	24–36 Hours	36–48 Hours	48 Hours
January	10	90	62	23	15
April	33	67	34	54	12
July	79	21	81	19	..
October	72	28	18	78	4

From the above it will be noticed that in the month of July only 21 per cent of the milk had the age stated on the tag.

Percentage of Temperatures.

Months	Below 45° F.	45–50° F.	50–55° F.	55–60° F.	60–70° F.
January	92	8	..	..	..
April	41	50	9	..	..
July	23	28	39	5	5
October	87	5	8	..	..

Percentage of Bacteriological Counts.

Months	Less than 50,000 Bacteria per c.c.	50,000 to 100,000 Bacteria per c.c.	100,000 to 1,000,000 Bacteria per c.c.	1,000,000 and over Bacteria per c.c.
January	84	5	10	1
April	88	4	7	1
July	68	12	17	3
October	83	11	3	3

PASTEURIZED MILK IN BOTTLES.

Percentage of Age of Milk.

Months	Not Stated	Stated	24–36 Hours	36–48 Hours	48 Hours and over
January	16	84	47	27	26
April	6	94	40	40	20
July	50	50	14	54	32
October	67	33	24	67	9

Percentage of Temperatures.

Months	Under 45° F.	45–50° F.	50–55° F.	55–60° F.	60–70° F.
January	90	..	..	4	6
April	62	24	14	..	..
July	37	19	30	14	..
October	62	21	17	..	..

Percentage of Bacteriological Counts.

Months	Under 50,000 Bacteria per c.c.	50,000 to 100,000 Bacteria per c.c.	100,000 to 1,000,000 Bacteria per c.c.	1,000,000 and over Bacteria per c.c.
January	77	19	4	..
April	66	16	13	5
July	49	20	31	..
October	64	12	22	2

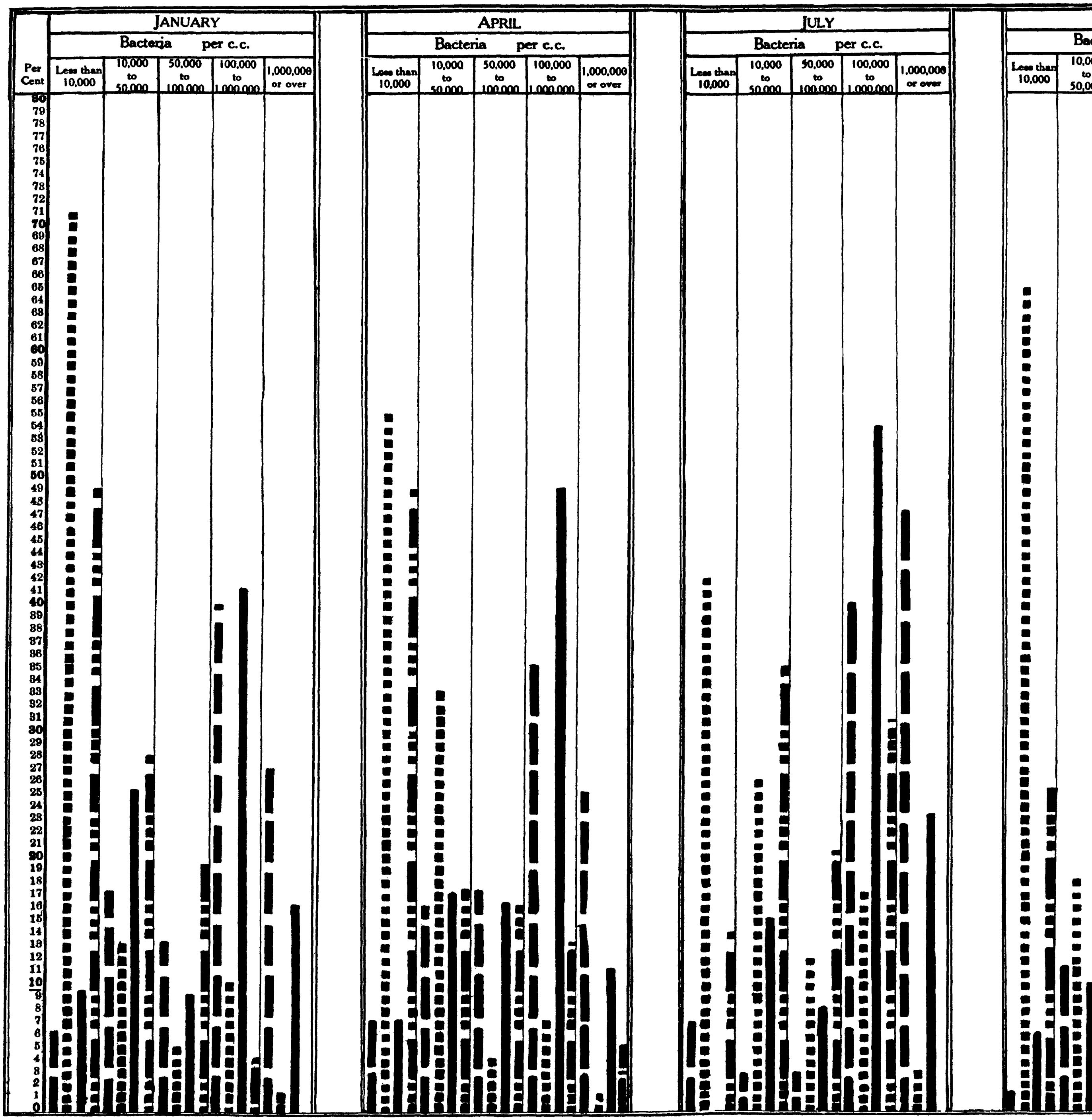
From the preceding tabulation it is seen that the bacterial counts in pasteurized milk are considerably less than in raw milk. Four factors, acting singly or together, account for the considerable percentage of persisting high counts: (1) improper pasteurization; (2) contamination of the milk through careless handling or unclean utensils; (3) holding too long, even up to 36 hours after pasteurization; (4) improper cooling methods.

The comparative bacteriological values of the four grades of milk sold in New York City is graphically shown in Chart 2, and accompanies the data given below.

MONTHS	TYPE OF MILK	BACTERIOLOGICAL COUNTS				
		Less than 10,000 Bacteria per c.c.	10,000 to 50,000 Bacteria per c.c.	50,000 to 100,000 Bacteria per c.c.	100,000 to 1,000,000 Bacteria per c.c.	1,000,000 and over Bacteria per c.c.
		Percentage	Percentage	Percentage	Percentage	Percentage
January	Raw milk in cans	6	17	13	37	27
	Past. " " "	71	13	5	10	1
	Raw " " bottles	9	25	9	41	16
	Past. " " "	49	28	1	10	4
April........	Raw milk in cans	7	16	17	35	25
	Past. " " "	55	33	4	7	1
	Raw " " bottles	7	17	16	49	11
	Past. " " "	49	17	16	13	5
July........	Raw milk in cans	7	3	3	40	47
	Past. " " "	42	26	12	17	3
	Raw " " bottles	..	15	8	54	23
	Past. " " "	14	35	20	31	..
October	Raw milk in cans	1	11	12	43	33
	Past. " " "	65	18	11	3	3
	Raw " " bottles	6	10	8	37	39
	Past. " " "	25	39	12	22	2

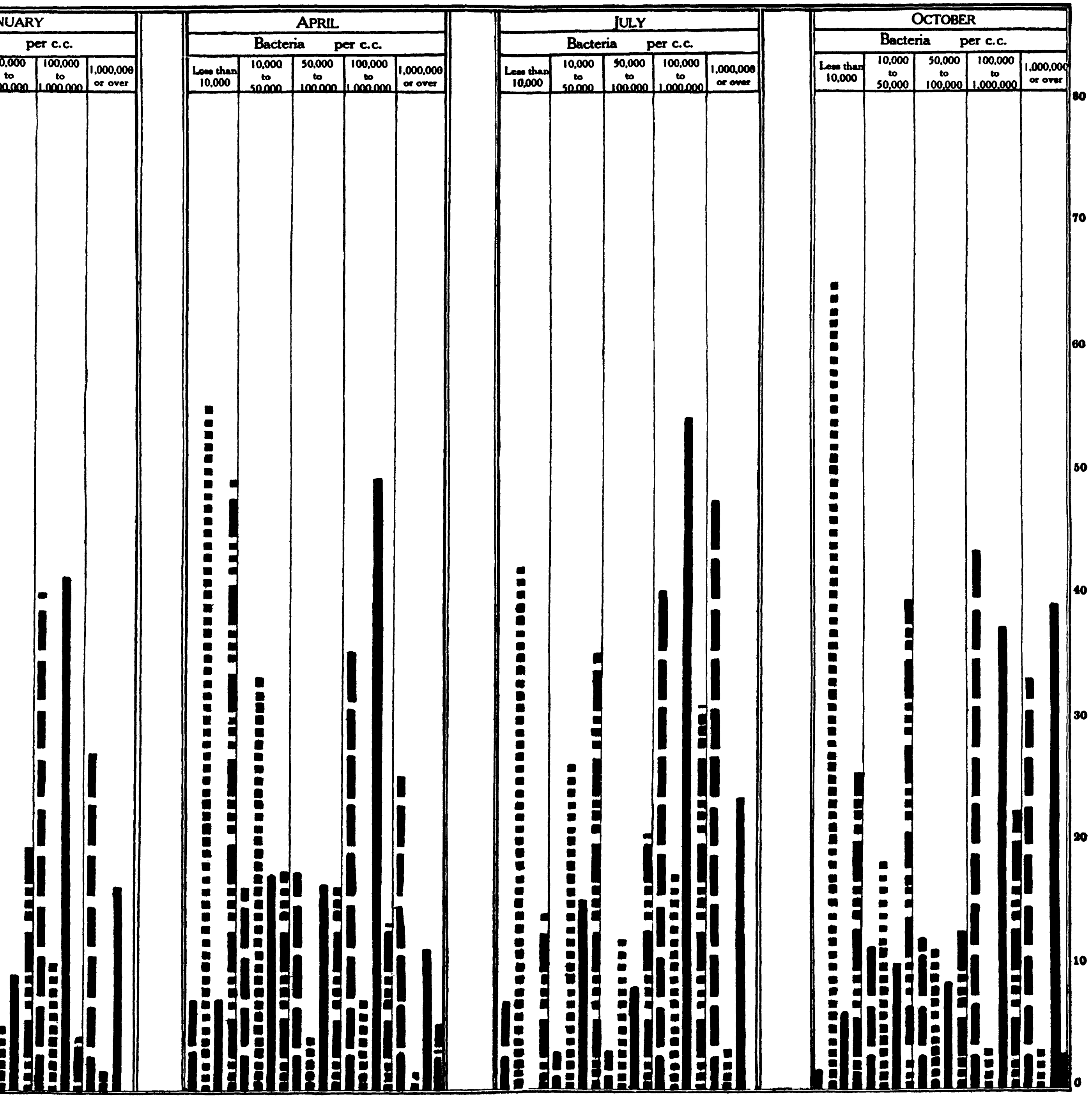
Heated milk in bottles.—As previously stated, the term heated milk is a name applied to milk which has been pasteurized by the flash process. This type of pasteurization is gradually being replaced by the "holder process" as the latter has been found more satisfactory. The numbers therefore are smaller than those of the raw milk, or those of the milk pasteurized by the holder process. The results are grouped together in tables on p. 19. The conditions shown in this table give fairly accurately the irregular results of the flash method of pasteurization.

Heated milk in cans.—As before stated, the milk known as heated milk is milk which has been pasteurized by the flash process.



KEY
Raw Milk in Cans represented by ▬▬ ▬▬ ▬▬
" " " Bottles " " ▬▬▬▬▬▬▬▬
Pasteurized Milk in Cans represented by ▪▪▪▪▪▪▪▪▪▪▪▪
" " " Bottles " " ▬▬ ▪▪▪ ▬▬

CHART 2.



KEY
Raw Milk in Cans represented by ▬ ▬ ▬
" " " Bottles " " ▬▬▬
Pasteurized Milk in Cans represented by ▪▪▪▪▪▪▪▪▪▪▪
" " " Bottles " " ▬ ▪▪▪ ▬

CHART 2.

This process was gradually replaced during the year by the holder process and we have, therefore, only 100 samples for the entire year. The results obtained are shown in Table 6.

HEATED MILK IN BOTTLES.

Percentage of Age of Milk.

Months		Not Stated	Stated	24–36 Hours	36–48 Hours	48 Hours and over
January	100 samples	52	48	62	25	13
April	50 "	38	62	26	45	29
July	50 "	62	38	..	100	..
October	50 "	46	54	15	85	..

Percentage of Temperatures.

Months	Under 45° F.	45–50° F.	50–55° F.	55–60° F.	60–70° F.
January	77	21	2	..	..
April	52	14	22	12	..
July	12	50	32	6	..
October	66	24	18	..	..

Percentage of Bacteriological Counts.

Months	Less than 10,000 Bacteria per c.c.	10,000 to 50,000 Bacteria per c.c.	50,000 to 100,000 Bacteria per c.c.	100,000 to 1,000,000 Bacteria per c.c.	1,000,000 and over Bacteria per c.c.
January	16	29	27	23	5
April	10	32	16	40	2
July	18	50	14	18	..
October	20	36	16	28	..

Summary.—The conclusions based upon the preceding analysis may be summarized as follows:

1. The greater portion of the milk is delivered by the dairymen to the creameries with a low bacterial content, namely, less than 50,000 bacteria per c.c. Out of 20,334 samples, 14,389 were below the figure given.

2. The greater portion of milk sold in New York City as raw milk, whether in cans or bottles, contains from 50,000 to 1,000,000 bacteria per c.c. and a considerable percentage contains over 1,000,000 bacteria per c.c.

3. The pasteurization of milk by the holding process, though still leaving much to be desired, reduces greatly the number of bacteria, besides destroying any pathogenic varieties.

4. Ice is not sufficiently used to cool the milk.

5. The average temperatures of the milk as delivered to the creameries by the dairymen, with the exception of the winter months, is still too high for milk to be shipped to New York, and has an unfavorable influence upon the milk by aiding the growth of bacteria.

6. Greater care should be observed to obtain clean milk by sterilizing the cans and bottles.

7. The greater part of the milk sold is from 36 to 48 hours old, but a considerable portion is from 72 to 96 hours old, and some even more than 96 hours. This is true of both raw and pasteurized milk.

In closing, thanks are due to the former and present members of the bacteriological squad for the hardships undergone and the careful interest displayed in their work. Thanks are also due to the Misses Hazel and Helen Connors, and Messrs. J. J. O'Brien, E. J. McCullen, and T. Schroeder, for their share in the compilation of the data required for this study.

MONTH DURING WHICH SAMPLES WERE TAKEN	TOTAL NUMBER OF CREAMERY PATRONS FROM WHOM SAMPLES WERE TAKEN	TOTAL OF SAMPLES													
		Night	Morn.	Mixed	Total	Less than 10,000						10,000 to 50,0			
						Night		Morn.		Mixed		Night		Morn.	
						No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per cent age
January	526	61	301	912	1,274	29	47.54	142	47.17	408	44.71	9	14.75	114	37.
February	612	305	200	961	1,466	105	34.4	125	62.50	348	36.19	106	34.75	59	29.
March	763	324	17	900	1,241	152	46.9	8	47.05	522	57.9	128	39.5	5	29.
April	842	636	37	467	1,140	326	51.26	19	51.35	328	70.19	183	28.75	11	29.
May	2,312	803	37	1,257	2,097	335	41.71	14	37.7	525	41.65	214	26.65	14	37.
June	1,934	1,119	49	931	2,099	332	29.66	20	40.81	269	28.78	326	29.13	19	38.
July	830	213	188	429	830	49	23.	83	44.14	167	38.91	57	26.75	81	43.
August	1,171	937	71	385	1,393	201	21.45	23	32.39	108	27.	223	23.79	23	32.
September	2,152	1,552	82	518	2,152	390	25.12	33	40.24	127	24.76	399	25.70	27	32.
October	2,714	1,909	133	761	2,802	775	40.59	54	40.60	306	40.86	651	34.1	45	33.
November	2,514	1,234	57	1,223	2,514	453	36.70	19	33.33	516	41.79	515	41.71	23	40.
December	1,326	792	31	503	1,326	248	31.31	13	41.93	184	36.43	271	34.21	14	45.
	17,696	9,885	1,202	9,247	20,334	3,395	34.34	553	46.	3,808	41.18	3,082	31.18	435	36.

MONTH DURING WHICH SAMPLES WERE TAKEN	Below 45° F.						45° to 50°						50°		
	Night		Morn.		Mixed		Night		Morn.		Mixed		Night		M
	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.
January	31	56.3	20	8.26	357	51.76	24	43.	49	20.24	196	28.42	....	.....	79
February	194	80.12	26	14.11	301	47.25	30	12.39	17	9.23	203	31.87	16	6.6	21
March	142	43.82	1	7.14	254	28.65	121	37.34	6	42.8	322	36.32	43	13.26	3
April	265	42.40	1	2.70	49	13.42	217	34.72	1	2.70	119	32.60	89	14.24	3
May	70	8.68	1	2.7	34	2.82	105	13.02	..	.....	160	13.28	180	22.32	1
June	18	1.81	7	14.28	2	.21	67	6.76	..	.....	54	5.77	239	24.13	..
July	11	5.55	..	.....	4	1.19	16	8.08	..	.....	15	4.47	47	23.73	..
August	13	1.56	..	.....	1	.37	37	4.44	..	.....	4	1.48	100	12.	..
September	90	5.94	..	.....	5	.10	106	6.99	..	.....	48	9.81	296	19.53	..
October	300	15.60	2	2.46	5	.71	580	30.10	..	.....	45	6.40	620	32.24	1
November	689	57.18	3	6.	355	29.46	345	28.53	3	6.	397	32.95	102	8.46	8
December	347	43.16	1	3.22	168	33.60	180	22.78	1	3.22	100	20.	198	24.94	5
	2,190	23.14	62	5.90	1,536	18.73	1,828	19.31	77	7.33	1,663	20.31	1,930	20.38	121

* Percentages based on number of samples in which temperature was stated. See Table 3.

TABLE 5.

Bacteria per Cubic Centimeter																					
0,000 to 50,000				50,000 to 100,000						100,000 to 1,000,000,						1,000,000 or over					
Morn.		Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed	
No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age
114	37.8	349	38.25	16	26.22	31	10.29	81	8.87	6	9.83	13	4.31	72	7.89	1	1.63	1	.33	2	.10
59	29.50	448	46.59	67	21.96	9	4.5	93	9.67	27	8.8	7	3.5	66	6.86	..	....	..	....	6	.62
5	29.4	288	31.99	28	8.64	2	11.1	60	6.6	10	3.08	2	11.1	27	2.9	6	1.85	..	....	3	.33
11	29.72	95	20.33	52	8.17	4	10.8	22	4.7	70	11.	3	8.1	21	4.49	5	.78	..	....	1	.21
14	37.7	352	27.8	123	15.31	5	13.5	175	13.82	118	14.6	3	8.1	172	13.58	13	1.61	1	2.7	33	2.6
19	38.70	344	36.80	118	10.54	4	8.16	84	8.98	239	21.35	5	10.20	166	17.76	104	9.28	1	2.04	68	7.27
81	43.08	101	23.53	36	16.80	13	6.91	83	17.33	53	24.88	9	4.78	68	15.64	18	8.45	2	1.06	10	2.33
23	32.39	94	23.5	111	11.84	10	14.08	60	15.	223	23.79	8	11.26	88	22.	179	19.10	7	9.85	35	8.75
27	32.92	107	20.86	204	13.14	10	12.19	84	16.37	394	25.38	11	13.41	120	23.39	165	10.63	1	1.21	80	15.59
45	33.83	238	31.17	197	10.31	17	12.77	101	13.23	247	12.93	16	12.03	95	12.44	39	2.04	..	....	21	2.75
23	40.35	494	40.01	166	13.45	4	7.01	138	11.17	95	7.69	11	19.29	74	5.99	5	.40	..	....	1	.08
14	45.16	206	13.26	126	15.78	2	6.45	67	13.32	140	17.67	1	3.22	43	8.54	7	.88	1	3.22	3	.59
435	36.19	3,116	33.69	1,244	12.67	111	9.23	1,048	11.33	1,622	63.00	89	7.40	1,012	10.94	542	5.48	14	1.16	263	2.85

TABLE 5.—*Continued.*

Temperatures Fahrenheit*																							Samples from Dairy-
50° to 55°					55° to 60°						60° to 70°						70° or over						
ht	Morn.		Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed		
Per-cent-age	No.	Per-cent age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	
.....	79	32.64	100	14.5	...	.....	43	17.76	37	5.36	...	.....	42	17.35	...	.....	..	....	9	3.71	..	....	42
6.6	21	11.4	86	13.5	2	.82	49	26.6	31	13.5	...	.....	31	4.80	16	2.51	..	....	40	21.72	..	....	37
13.26	3	21.4	205	23.12	17	5.24	2	14.2	67	7.55	11	.3	1	7.14	32	3.6	..	....	1	7.4	6	.67	44
14.24	3	8.10	133	36.44	235	5.60	4	10.80	52	14.24	18	2.88	9	24.30	10	2.74	..	....	19	51.30	..	....	65
22.32	1	2.7	260	21.58	225	27.90	14	37.8	386	32.03	215	26.60	7	18.9	327	27.14	8	.99	14	37.8	27	2.24	1,34
24.13	..	.....	294	31.45	70	27.27	..	.....	266	28.46	360	36.36	..	.....	255	27.28	35	3.53	42	85.68	60	6.42	81
23.73	..	.....	90	26.82	52	26.26	..	.....	164	48.97	67	33.83	45	23.89	56	16.69	5	2.52	143	75.93	6	1.79	35
12.	..	.....	21	8.17	206	24.72	1	1.4	64	23.68	434	52.08	10	14.	160	59.20	40	4.8	60	84.	20	7.40	58
19.53	..	.....	95	19.46	502	33.13	1	1.51	194	39.75	500	33.	14	21.21	126	25.80	8	.52	51	77.26	20	4.09	52
32.24	1	1.23	182	26.	341	17.73	5	6.15	298	42.57	68	3.53	40	49.20	165	23.57	..	...	33	40.59	5	.71	62
8.46	8	16.	286	23.73	64	5.31	16	32.	100	8.30	...	.....	17	34.	53	4.39	..	...	3	6.	3	.24	49
24.94	5	16.10	142	28.40	50	6.30	5	16.10	46	9.20	12	1.51	10	32.20	40	8.	3	.37	9	29.98	4	.08	26
20.38	121	11.52	1,894	23.12	1,764	18.62	140	13.33	1,705	20.82	1,675	17.69	226	21.52	1,240	15.12	99	1.04	424	40.38	151	1.86	6,90

TIMETER

		100,000 to 1,000,000,						1,000,000 or over					
Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed	
No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
81	8.87	6	9.83	13	4.31	72	7.89	1	1.63	1	.33	2	.10
93	9.67	27	8.8	7	3.5	66	6.86	..	....	..	....	6	.62
60	6.6	10	3.08	2	11.1	27	2.9	6	1.85	..	....	3	.33
22	4.7	70	11.	3	8.1	21	4.49	5	.78	..	....	1	.21
175	13.82	118	14.6	3	8.1	172	13.58	13	1.61	1	2.7	33	2.6
84	8.98	239	21.35	5	10.20	166	17.76	104	9.28	1	2.04	68	7.27
83	17.33	53	24.88	9	4.78	68	15.64	18	8.45	2	1.06	10	2.33
60	15.	223	23.79	8	11.26	88	22.	179	19.10	7	9.85	35	8.75
84	16.37	394	25.38	11	13.41	120	23.39	165	10.63	1	1.21	80	15.59
101	13.23	247	12.93	16	12.03	95	12.44	39	2.04	..	....	21	2.75
138	11.17	95	7.69	11	19.29	74	5.99	5	.40	..	....	1	.08
67	13.32	140	17.67	1	3.22	43	8.54	7	.88	1	3.22	3	.59
048	11.33	1,622	63.00	89	7.40	1,012	10.94	542	5.48	14	1.16	263	2.85

															METHOD OF COOLING				
0°			60° to 70°						70° or over						Samples from Dairymen Using Ice	Samples from Dairymen Not Using Ice	Samples from Dairymen Using Springs or Wells	Cooling Method Not Indicated	Total of Samples Taken
	Mixed		Night		Morn.		Mixed		Night		Morn.		Mixed						
Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage					
.76	37	5.36	...	.....	42	17.35	...	.....	..	....	9	3.71	..	....	422	398	...	454	1,274
.6	31	13.5	...	.....	31	4.80	16	2.51	..	....	40	21.72	..	....	371	244	...	851	1,466
.2	67	7.55	11	.3	1	7.14	32	3.6	..	....	1	7.4	6	.67	449	502	...	290	1,241
.80	52	14.24	18	2.88	9	24.30	10	2.74	..	....	19	51.30	..	....	659	409	3	69	1,140
.8	386	32.03	215	26.60	7	18.9	327	27.14	8	.99	14	37.8	27	2.24	1,345	515	...	237	2,097
...	266	28.46	360	36.36	..	.....	255	27.28	35	3.53	42	85.68	60	6.42	812	647	5	635	2,099
...	164	48.97	67	33.83	45	23.89	56	16.69	5	2.52	143	75.93	6	1.79	354	336	10	130	830
.4	64	23.68	434	52.08	10	14.	160	59.20	40	4.8	60	84.	20	7.40	583	574	112	224	1,393
.51	194	39.75	500	33.	14	21.21	126	25.80	8	.52	51	77.26	20	4.09	525	1,140	129	358	2,152
.15	298	42.57	68	3.53	40	49.20	165	23.57	..	...	33	40.59	5	.71	621	1,751	188	242	2,802
.	100	8.30	...	.....	17	34.	53	4.39	..	...	3	6.	3	.24	499	1,752	...	263	2,514
.10	46	9.20	12	1.51	10	32.20	40	8.	3	.37	9	29.98	4	.08	268	951	1	106	1,326
.33	1,705	20.82	1,675	17.69	226	21.52	1,240	15.12	99	1.04	424	40.38	151	1.86	6,908	9,219	348	3,859	20,334

Quarterly Statement	Number of Samples Taken for Examination	Number of Dealers from Whom Samples Were Taken	Number of Creameries Represented	Unknown Sources	Origin of Milk as Stated on Labels		Age of Milk							
							Stated		Not Stated		From 24 to 36 Hours		From 3 48 Ho
					No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.
January—													
Raw, cans	100	26	26	9	85	85	65	65	35	35	55	85	..
" bottles	100	23	23	1	98	98	73	73	27	27	45	62	25
Past., cans	100	2	2	6	35	35	90	90	10	10	56	62	21
" bottles	100	14	6	13	31	31	84	84	16	16	39	47	23
Heated, bottles	100	14	7	13	24	24	48	48	52	52	30	62	12
April—													
Raw, cans	100	42	56	2	96	96	94	94	6	6	63	67	8
" bottles	100	20	22	3	88	88	100	100	..	..	78	78	18
Past., cans	100	5	5	6	39	39	67	67	33	33	23	34	36
" bottles	100	11	18	13	45	45	94	94	6	6	38	40	38
Heated, bottles	50	9	9	8	22	44	31	62	19	38	8	26	14
July—													
Raw, cans	100	30	36	..	100	100	82	82	18	18	70	85	..
" bottles	100	18	21	..	100	100	88	88	12	12	88	100	..
Past., cans	100	6	4	19	17	17	21	21	79	79	17	81	4
" bottles	100	18	4	14	20	20	50	50	50	50	7	14	27
Heated, bottles	50	4	1	12	5	10	19	38	31	62	..	..	19
October—													
Raw, cans	100	28	35	3	97	97	91	91	9	9	65	71	17
" bottles	100	23	27	2	91	91	97	97	3	3	85	88	6
Past., cans	100	6	4	12	22	22	28	28	72	72	5	18	22
" bottles	100	15	3	14	11	11	33	33	67	67	8	24	22
Heated, bottles	50	5	1	9	2	4	27	54	23	46	4	15	23
Heated, cans, for 1911	100	7	6	17	37	37	55	55	45	45	31	56	19

TABLE 6.

ILK				METHOD OF COOLING				TEMPERATURES										BACTERIOLOGICA				
From 36 to 48 Hours		48 Hours and over		Stated		Not Stated		Under 45° F.		From 45° to 50° F.		From 50° to 55° F.		From 55° to 60° F.		From 60° to 70° F.		Less than 10,000		From 10,000 to 50,000		Fro 50,00 100,0
No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.
..	..	10	15	28	28	72	72	89	89	1	1	10	10	..	..	..	..	6	6	17	17	13
25	34	3	4	95	95	5	5	82	82	13	13	5	5	..	..	..	..	9	9	25	25	9
21	23	13	15	100	100	..	..	92	92	8	8	..	..	..	..	..	..	71	71	13	13	5
23	27	22	26	100	100	..	..	90	90	..	..	..	..	4	4	6	6	49	49	28	28	19
12	25	6	13	97	97	3	3	77	77	21	21	2	2	..	..	..	..	16	16	29	29	27
8	9	23	24	64	64	36	36	78	78	11	11	11	11	..	..	..	..	7	7	16	16	17
18	18	4	4	100	100	..	..	79	79	17	17	4	4	..	..	..	..	7	7	17	17	16
36	54	8	12	85	85	15	15	41	41	50	50	9	9	..	..	..	..	55	55	33	33	4
38	40	18	20	94	94	6	6	62	62	24	24	14	14	..	..	..	..	49	49	17	17	16
14	45	9	29	50	100	..	..	26	52	7	14	11	22	6	12	..	..	5	10	16	32	8
..	..	12	15	91	91	9	9	26	26	45	45	17	17	8	8	4	4	7	7	3	3	3
..	..	..	..	100	100	..	..	56	56	20	20	21	21	3	3	..	..	..	..	15	15	8
4	19	..	..	99	99	1	1	23	23	28	28	39	39	5	5	5	5	42	42	26	26	12
27	54	16	32	100	100	..	..	37	37	19	19	30	30	14	14	..	..	14	14	35	35	20
19	100	..	..	50	100	..	..	6	12	25	50	16	32	3	6	..	..	9	18	25	50	7
17	19	9	9	99	99	1	1	32	32	57	57	11	11	..	..	..	..	1	1	11	11	12
6	6	6	6	100	100	..	..	77	77	13	13	10	10	..	..	..	..	6	6	10	10	8
22	78	1	4	96	96	4	4	87	87	5	5	8	8	..	..	..	..	65	65	18	18	11
22	67	3	9	90	90	10	10	62	62	21	21	17	17	..	..	..	..	25	25	39	39	12
23	85	..	..	50	100	..	..	33	66	12	24	5	10	..	..	..	..	10	20	18	36	8
19	35	5	9	90	90	10	10	51	51	7	7	41	41	1	1	..	..	23	23	30	30	14

Temperatures										Bacteriological Count									
Under 45° F.		From 45° to 50° F.		From 50° to 55° F.		From 55° to 60° F.		From 60° to 70° F.		Less than 10,000		From 10,000 to 50,000		From 50,000 to 100,000		From 100,000 to 1,000,000		Over 1,000,000	
No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age	No.	Per-cent-age
89	89	1	1	10	10	..	..	..	..	6	6	17	17	13	13	37	37	27	27
82	82	13	13	5	5	..	..	..	..	9	9	25	25	9	9	41	41	16	16
92	92	8	8	..	..	..	..	..	..	71	71	13	13	5	5	10	10	1	1
90	90	..	..	..	..	4	4	6	6	49	49	28	28	19	19	4	4	..	..
77	77	21	21	2	2	..	..	..	..	16	16	29	29	27	27	23	23	5	5
78	78	11	11	11	11	..	..	..	..	7	7	16	16	17	17	35	35	25	25
79	79	17	17	4	4	..	..	..	..	7	7	17	17	16	16	49	49	11	11
41	41	50	50	9	9	..	..	..	..	55	55	33	33	4	4	7	7	1	1
62	62	24	24	14	14	..	..	..	..	49	49	17	17	16	16	13	13	5	5
26	52	7	14	11	22	6	12	..	..	5	10	16	32	8	16	20	40	1	2
26	26	45	45	17	17	8	8	4	4	7	7	3	3	3	3	40	40	47	47
56	56	20	20	21	21	3	3	..	..	..	..	15	15	8	8	54	54	23	23
23	23	28	28	39	39	5	5	5	5	42	42	26	26	12	12	17	17	3	3
37	37	19	19	30	30	14	14	..	..	14	14	35	35	20	20	31	31	..	..
6	12	25	50	16	32	3	6	..	..	9	18	25	50	7	14	9	18	..	..
32	32	57	57	11	11	..	..	..	..	1	1	11	11	12	12	43	43	33	33
77	77	13	13	10	10	..	..	..	..	6	6	10	10	8	8	37	37	39	39
87	87	5	5	8	8	..	..	..	..	65	65	18	18	11	11	3	3	3	3
62	62	21	21	17	17	..	..	..	..	25	25	39	39	12	12	22	22	2	2
33	66	12	24	5	10	..	..	..	..	10	20	18	36	8	16	14	28	..	..
51	51	7	7	41	41	1	1	..	..	23	23	30	30	14	14	32	32	1	1